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International GPS Service

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Subject: Continental Reference System for Africa, African Reference System ÔAFREFÕ

Dear colleague,

A number of discussions over the past year strongly suggest that it is time to initiate an effort towards realizing a modern continental geodetic reference system for Africa. The International Association of Geodesy (IAG) Commission X on Global and Regional Geodetic Networks and the International GPS Service (IGS), through contacts with various organizations and people within Africa, support the establishment of such a project within Africa. This letter solicits your interest in such an effort.

The most effective way to achieve a robust and globally consistent continental reference system is through the technology of the Global Positioning System (GPS). The explosive growth of GPS applications and the economics of GPS make it the technique of choice for sustainable geodetic operations within Africa. The IGS, as an existing IAG service, provides high quality GPS data, products and information resources that can further the realization of an African continental reference system. The IGS strongly supports the charter of the International Terrestrial Reference System (ITRS), part of the International Earth Rotation Service (IERS), which relies to a great extent on IGS and GPS for densification of the International Terrestrial Reference Frame (ITRF). We recall that ITRS is the global terrestrial reference system officially adopted by the IAG, and that the WGS84 (World Geodetic System 1984) reference system of the GPS, which is widely used by several communities, is now identical to ITRS at the centimeter level.

Due to the permanent global infrastructure of the IGS, a flexible approach can be designed to accomplish a continental reference system for Africa. First, permanent GPS stations within Africa are or can be linked to the highly consistent daily processing of the IGS. A sparse number of these currently exist and provide a backbone of precise control — it would be clearly beneficial to increase the number of permanent IGS stations within the African area (see IGS map at http://igscb.jpl.nasa.gov/network/netindex.html). Secondly, additional stations are required for the regional densification such as establishing GPS national networks through either permanent or semi-permanent GPS networks; or in specific areas through campaign style or single point measurements with mobile GPS receivers.

It is important to note that contrary to previous GPS network observations where it was important to have an entire network observe simultaneously, it is no longer necessary to do so. Through the continuity and permanency of the global infrastructure provided by the IGS, GPS observations taken at one time can be linked to observations taken at a subsequent

locations and times with little degradation of accuracy. In fact, given the vast extent of Africa and logistical difficulties of coordinating between more than 50 nations, a more regional approach tied to a fiducial continental network seems more feasible and prudent.

All subsequent analysis and results can be based on the precise products and orbits produced by the IGS to position stations in the ITRF, as well as providing the basis for transformations between it and any national geodetic datum. By following IGS/ITRF recommendations and conventions, centimeter level 3-dimensional positioning can be obtained within this framework. The applications of realizing this have vast potential from geodesy, mapping, surveying, geoinformation, geomanagement, natural hazards mitigation, Earth sciences, etc. Additionally, the project will provide a major springboard for the transfer and enhancement of skills in surveying and geodesy and especially GPS technology. Surveyors and geodesists from participating African countries will be strongly encouraged to actively participate in all phases of the project.

Over recent years there are models of other continents and countries realizing a continental reference system. For example, EUREF, the European Reference System for Europe, and SIRGAS, Sistema de Referencia Geocentrico para America del Sur, a continental reference system throughout South America. Currently a new initiative to join reference networks within North America is being pursued by the national agencies and organizations within the U.S., Canada, Mexico, the Caribbean nations, etc.

It is clear that the leadership for such a project must come from within the African professional community. Preliminary meetings within Africa to discuss project interest and approach will be initiated. IGS and IAG experts and advisors will be available to advocate the formation of such a project within Africa. The IGS and IAG would be willing to attempt coordinating international resources and assistance to facilitate such an activity. It would be important over the longer term to ensure that this project will produce established, dedicated analysis and data information centers, links between African agencies and links with international organizations. Venues for such organizational meetings are currently being considered and it is envisioned that a series of discussions may take place as opportunities arise at scheduled conferences and meetings.

On behalf of IAG and IGS, we would like to invite your participation in this effort. Please respond to this letter by sending a statement of your interest along with your contact information to the address below or email to igscb.jpl.nasa.gov with subject ÔAFREF InterestÕ A primary contact list will be compiled from the responses; these people will be included in any correspondence and notified of future meetings to discuss plans and organization of such a project. An AFREF mail list has been established by the IGS to facilitate discussion. You may view the correspondences and other information at:
http://igscb.jpl.nasa.gov/mail/afref/afref.html, as well as instructions to subscribe.

Looking forward to your positive reply, and with best regards,

Claude Boucher
Chair, IAG Commission X, Global and Regional Networks
Head, International Terrestrial Reference Frame, IERS / IERS Representative to IGS Governing Board

Ruth E. Neilan
Director, IGS Central Bureau
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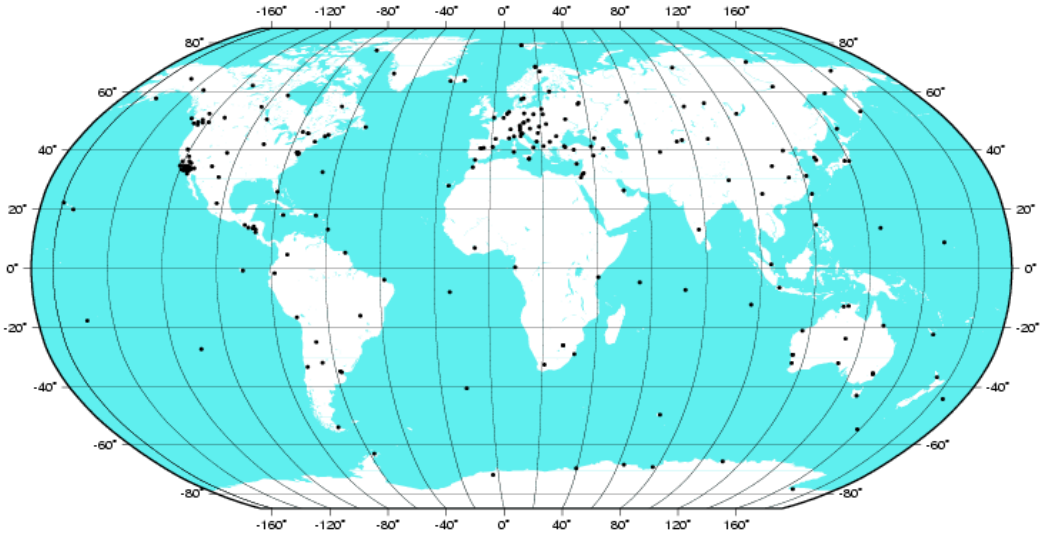
Reference Web Sites:
IAG: http://www.gfy.ku.dk/~iag
IAG Commission X: http://lareg.ensg.ign.fr/GRGN/
IGS: http://igscb.jpl.nasa.gov
IERS: http://www.iers.org/
ITRF: http://lareg.ensg.ign.fr/ITRF/
FAGS: http://www.kms.dk/fags/
SIRGAS:
http://www.dgfi.badw-muenchen.de/gps/sirgas.html,
http://dgfi.badw-muenchen.de/dgfi/SIRGAS/sirgas.html
EUREF: http://homepage.oma.be/euref/



IGS Network Station Distribution, January 2001. For more details see:
http://igscb.jpl.nasa.gov/network/netindex.html